WHAT IS CLAIMED IS:

1. A sand pile driving method for driving a granule pile in a ground comprising a procedure of alternately performing a pull out procedure to pull out a casing pipe while discharging granule from a lower end portion of the casing pipe and a compaction procedure to compact a discharged granule by penetrating the casing pipe again, following an initial penetration procedure for penetrating the casing pipe to a predetermined depth in the ground, wherein:

the compaction procedure is for compacting the granule by rotational motion of the casing pipe and pressing the granule downward thereby; and

at least a compaction time is controlled based on a driving torque for rotational motion of the casing pipe against the granule.

2. The sand pile driving method according to claim 1, wherein the compaction time of the compaction procedure is further controlled based on a thrust force of the casing pipe for pressing the granule.

3. A sand pile driving method for driving a granule pile in a ground comprising a procedure of alternately performing a pull out procedure to pull out a casing pipe while discharging granule from a lower end portion of the casing pipe and a compaction procedure to compact a discharged granule by penetrating the casing pipe again, following an initial penetration procedure for penetrating the casing pipe to a predetermined depth in the ground, wherein:

the compaction procedure is for compacting the granule by rotational motion of the casing pipe and pressing the granule downward thereby; and

the compaction procedure is completed at a point in a case where a compaction condition satisfies a given condition, the compaction condition being estimated by a thrust force of the casing pipe for pressing the granule pile and a driving torque for rotational motion of the casing pipe against the granule pile.

4. The sand pile driving method according to claim 3, wherein the driving torque is estimated based on a driving torque of the casing pipe in the pull out procedure

and on a driving torque of the casing pipe in the compaction procedure.

5. The sand pile driving method according to claim 3, wherein the compaction condition F is estimated by an expression

$$F= \alpha \cdot P \cdot (T2/T1) \cdot t + \beta,$$

where P is the thrust force of the casing pipe, T1 is the driving torque of the casing pipe in the pull out procedure, T2 is the driving torque of the casing pipe in the compaction procedure, t is a compaction time, and α and β are coefficients acquired from construction data.

6. The sand pile driving method according to claim 1, wherein the compaction time for the compaction procedure is controlled based on a cross-sectional area of a pile.

7. A sand pile driving method for driving a granule pile in a ground comprising a procedure of alternately performing a pull out procedure to pull out a casing pipe while discharging granule from a lower end portion of the casing pipe and a compaction procedure to compact a discharged granule by penetrating the casing pipe again, following an initial penetration procedure for penetrating the casing pipe to a predetermined depth in the ground, wherein:

a compaction condition for compacting granule by the casing pipe and a cross-sectional area of the granule pile compacted by the casing pipe are always estimated in the compaction procedure;

a compaction is completed at a point that the pile cross-section area reaches a minimum cross-section area in a case where the pile cross-section area of the granule pile compacted by the casing pipe reaches a given state before the pile cross-section area reaches the minimum pile cross-section area;

the compaction is completed at the point that the pile cross-section area reaches a given state in a case where the pile cross-section area of the granule pile compacted by the casing pipe reaches the given state before the pile cross-section area reaches a maximum pile cross-section area; and

the compaction is completed at the point that the pile cross-section area reaches the maximum cross-section area in a case where the pile cross-section area of the

granule pile compacted by the casing pipe reaches the maximum pile cross-section area before the pile cross-section area reaches the given state.

8. The sand pile driving method according to claim 7, wherein a compaction schedule, the granule pile is compacted by pressing the granule pile downward by the casing pipe and a rotational motion thereof; and

the compaction condition is estimated by at least a thrust force of the casing pipe pressing the granule pile and a torque for rotational motion of the casing pipe against the granule pile.

9. The sand pile driving method according to claim 7, wherein the compaction condition F is estimated by an expression

$$F = \alpha \cdot P \cdot (T2/T1) \cdot t + \beta,$$

where P is the thrust force of the casing pipe, T1 is a torque of the casing pipe in the pull out procedure, T2 is a torque of the casing pipe in the compaction procedure, t is a compaction time, and α and β are coefficients acquired from construction data.

10. A sand pile driving method for driving a granule pile in a ground comprising a procedure of alternately performing a pull out procedure to pull out a casing pipe while discharging granule from a lower end portion of the casing pipe and a compaction procedure to compact a discharged granule by penetrating the casing pipe again, following an initial penetration procedure for penetrating the casing pipe to a predetermined depth in the ground, comprising:

the compaction procedure for compacting the granule pile by a rotational motion of the casing pipe and pressing the granule pile downward thereby;

a first step for driving a plurality of first piles in a given area; and

a second step for additionally driving a plurality of second piles between the previously driven first piles within the area.

11. The sand pile driving method according to claim 10, wherein a compaction time is arranged based on a driving torque for rotational motion of the casing pipe against the granule pile in the compaction procedure for making at least one of a

plurality of the first piles.

12. The sand pile driving method according to claim 10, wherein compaction time is arranged based on the driving torque for rotational motion of the casing pipe against the granule pile in the compaction procedure for making at least one of a plurality of the second piles.

13. The sand pile driving method according to claim 2, wherein the compaction time for the compaction procedure is controlled based on a cross-sectional area of a pile.